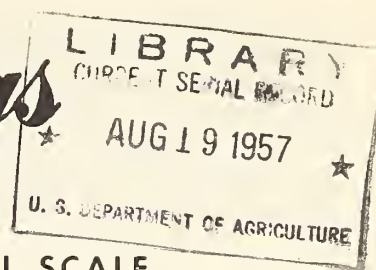


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Frozen Eggs



LAYOUT AND DESCRIPTION OF A SMALL SCALE EGG BREAKING OPERATION

One of the best ways of conserving eggs which are not profitably marketed in the shell is to remove the contents from the shell and preserve the liquid egg by freezing. Current receipt eggs to be graded and cartoned include varying percentages of eggs which are good food but may not be suitable for the packer's cartoned egg outlets. These eggs are often priced well below their real food value. Such eggs may profitably be broken out to produce liquid and frozen egg products which may be marketed locally to bakeries.

This pamphlet has been prepared to provide information for egg handlers on the facilities and procedure for processing liquid and frozen eggs on a small scale.

The recommendations concerning facilities, operating procedures and sanitation are the minimum necessary to produce satisfactory wholesome egg products. They are requirements for plants operating voluntarily under the USDA egg products inspection service.

Sanitary Control

The paramount factors for the production of good-quality frozen eggs are good refrigeration and sanitation. Carelessness in the handling of liquid eggs can cause serious loss. Adequate sanitation includes proper construction, ventilation of the breaking room, proper type of equipment, good health and personal cleanliness of employees, and proper facilities for cleaning and sanitizing the processing rooms and equipment. Rapid handling of eggs in the plant and keeping them at low temperatures are of great importance. The shortest possible time should elapse between the removal of breaking stock from the chilled storage and the placing of the liquid egg in the freezer. It is necessary also that liquid egg temperatures during processing be sufficiently low to minimize bacterial growth. If the liquid egg is properly processed at low temperatures and placed into the freezer promptly, bacterial growth can be controlled.

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The majority of the bacteria found in well prepared frozen eggs are air and water saprophytes and are considered non-pathogenic. They do, however, decompose the egg, causing bad odors and flavors to develop. They are the chief cause of inedible frozen egg. Coliform organisms with which the shells of dirty eggs are plentifully supplied, may find their way into the product when eggs with wet or dirty shells are broken. Since these organisms indicate fecal contamination their presence is of importance.

Rooms and Equipment

In modern egg packing plants, the walls and floors of candling rooms are so constructed that they can be easily cleaned and give maximum protection against temperature changes. Good ventilation and maintenance of temperatures below 70° F. are important. The candling devices should throw sufficient light into the egg case or container from which the eggs are being removed to enable candlers to detect inedible, dirty, or checked eggs.

The shell egg storage room should be capable of precooling all shell eggs to temperatures low enough to insure that the temperature of the liquid egg will not exceed 70° F. at any time. The room should be kept clean and free from objectionable odors and mold growth.

The egg washing room or area should be separated from the breaking and sanitizing areas. It should be well-lighted and the floor should be of water-proof composition and should be constructed so as to allow thorough cleaning and adequate drainage. Ventilation, preferably by means of a variable speed exhaust fan, should be provided for the removal of objectionable vapors and odors. All shell eggs with adhering dirt should be cleaned prior to breaking.

The surface of the ceiling and walls of the breaking room should be smooth and made of a glazed tile or other water-resistant material. The floor should be of water-proof composition and reasonably free from cracks or rough areas. It should be graded to permit run-off and leave no standing water. All floor drains should be equipped with traps, and constructed so as to minimize clogging. Intersections of walls with curbing or floors should be impervious to water. The room should have at least 30 foot candles of light on all working surfaces except at breaking and inspection tables where light intensity should be at least 50 foot candles. The temperature should be maintained at 70° F. or below. Ventilation should be such that the volume of relatively odorless filtered air drawn into the room will be greater than the volume removed by the exhaust fan. An exhaust fan should be located in the sanitizing area. The fans should be equipped with variable speed controls. An air conditioning unit may also be installed. Hand washing facilities should be operated by foot controls and should be conveniently located.

A well-equipped cleaning and sanitizing area with capacity to permit the prompt and thorough cleaning and sanitizing of equipment is an important adjunct in a modern egg-breaking operation. Sanitized utensils should be drained on aerated racks and should not be nested.

A layout for an egg breaking room and it's adjoining structure is shown on page 5. The room may be extended as desired, but there should be an allowance of 3 feet between tables and walls. The breaking table for 4 breakers,

is $2\frac{1}{2}$ feet wide and 6 feet long, though this may be lengthened to accommodate the number of operators desired. Corrosion-resistant metal is desirable for the construction of tables and drain racks. All equipment should be so designed as to insure thorough cleaning and sanitizing of all parts. So far as is practicable, all such equipment should be made of metal or other impervious material which will not affect the product by chemical action or physical contact. The items required for a small breaking operation are listed on page 4.

Operating Procedures

All shell eggs with adhering dirt should be cleaned prior to breaking. Eggs may be washed by hand or by various types of egg washing machines which are in commercial use. The temperature of the water used for washing of the eggs should at all times be at least 20° F. higher than the temperature of the eggs to be washed. The detergent-sanitizer or germicidal-detergent used must be a good cleaner, an effective germicide, odorless, colorless, and non-toxic. The washing solution must be clean and should be changed frequently. Detergent residue that remains on the eggs should be rinsed off with a water spray or with clean running water warmer than the eggs and the wash water. Immediately after the washing process, eggs should be dried quickly and thoroughly. Some of the methods of drying include passing eggs over or through a warm air blast as they leave the washer, spreading of eggs on wire trays or placing in baskets and drying by a blast of air. The cleaned eggs should either be broken immediately or cooled and broken within 24 hours.

All breaking room personnel should wash their hands thoroughly with odorless soap and water each time they enter the breaking room and prior to handling clean equipment after breaking an inedible egg. Perfumes and nail polish should not be used by personnel in the breaking room. Clean outer garments including caps, or head bands, should be worn by all breaking personnel. Breakers should use a complete set of clean equipment when starting work and after lunch periods. All table equipment should be exchanged for clean equipment at least every two hours.

The breakers are stationed on each side of the table. They remove shell eggs from the buckets or baskets two or three at a time and break them manually on the breaking knife over the drip tray, then deposit the liquid contents in cups that hold not more than three eggs. The empty egg shells are dropped through a shell funnel to a shell can. When the contents of two or three eggs are accumulated in each of two cups, the breaker inspects the cups of egg meat for wholesomeness by sight and smell. Cups of acceptable eggs are emptied into metal pails which, when filled, are placed on the inspection table for re-examination by a well-qualified employee before being emptied into the mixer.

If trays with recesses attached to the breaking knife are used instead of cups, the quality of the egg is determined by smelling the opened shell. The trays are adjustable to hold back two eggs at a time to allow for complete visual inspection and for removal of bad eggs.

Shell particles, meat and blood spots and foreign material accidentally falling into the cups or trays are removed with a spoon. Breakers should keep their fingers out of the cups, trays, pails and cans. Whenever an inedible egg is broken, the breaking equipment with which it has come in contact is

EQUIPMENT REQUIRED FOR 4 BREAKERS
FOR PROCESSING WHOLE EGG

Candling Room

40 Galvanized buckets or rubber coated wire baskets
Galvanized or plastic leaker trays
Metal container for inedible eggs
Conveyor (overhead or slide) for buckets of eggs
Shell egg washing equipment

Breaking Room

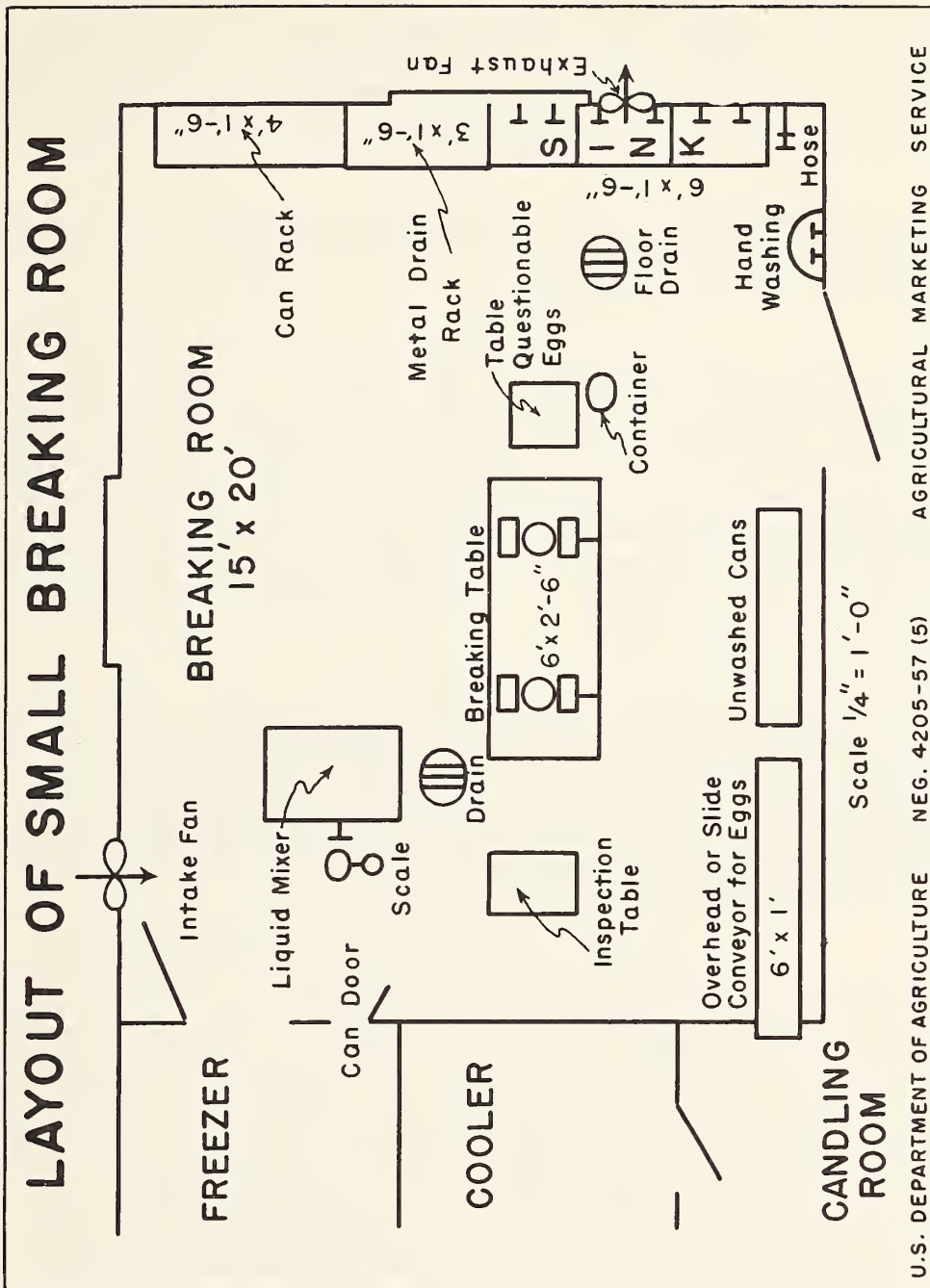
Breaking table
2 funnels
2 shell cans
2 shell tampers
8 drip breaking trays
12 breaking knives
24 breaking cups
8 spoons
Paper tissues and dispenser
18 stainless steel pails for eggs
Container for inedible eggs
Inspection table
Liquid egg churn
Scales
Hand washing facilities with pedal-valve
Uniforms for women
Intake filter fan

Sanitizing Area

Heavy duty, galvanized, three-section sink
Cups, tray and knife racks
Metal drain racks for equipment
Drain rack for empty cans
Clean-up pressure hose
Exhaust fan

Freezer Room

Freezer fans
Floor racks (optional)



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replaced with a complete set of clean equipment, except that only the cup need be exchanged when bloody whites or blood rings are encountered. In either case the operator should wash her hands before obtaining clean utensils, since hands are usually contaminated from touching the inedible eggs.

Inedible eggs include black rots, white rots, mixed rots, eggs with diffused blood in the albumen or on the yolk, green whites, crusted yolks, stuck yolks, developed embryos at or beyond the blood-ring stage, moldy eggs, sour or musty eggs, and any filthy or decomposed eggs. All inedible egg liquid should be placed in a clearly identified container containing a denaturant.

Edible eggs include all eggs which are fit for human food and include eggs from which meat or blood spots (localized clots of meat or blood which can be removed readily) have been removed.

Various kinds of liquid egg mixers on the market will make a homogeneous mixture from liquid whole eggs without beating air into them. These devices must stir or mix, not beat. With one type of mixer in common use, the whole eggs are poured into the dump hopper where the liquid eggs pass through $\frac{1}{4}$ inch blades to break the yolks and catch any large shells. The liquid eggs then pass through a finely perforated removable cylindrical strainer with a scraper which continuously revolves and removes bits of shell membrane and shell particle. The product is drawn off into the final containers, usually 10 or 30-pound containers which are made of lacquered tin or specially treated paper. Metal containers and lids should be thoroughly washed, rinsed and drained immediately prior to filling.

Great care must be taken to keep the liquid egg cold until marketed or placed in the freezer. At no time during processing should the temperature of liquid egg exceed 70° F. The egg must be solidly frozen as quickly as possible. A good practice is to freeze at -10° F. or lower in circulating air. Containers should be stacked so as to permit circulation of air around each individual container until the egg is frozen. For holding the product after freezing the temperature should be 0° F. or lower.

It is not considered practical to process the whites and yolks separately in a small operation employing less than 10 breakers. If only a few breakers are employed the liquid products do not accumulate fast enough to keep them moving directly and continuously into the freezer. If the egg contents are separated into yolk and white, a "separator" attached to the breaking knife is used. The liquid yolks are mixed and strained the same as whole eggs. Blending 10 percent sugar or salt by weight into the yolk before freezing helps emulsify the product so that it thaws out smoothly without gummy or lumpy particles. The separated whites are frozen without any added ingredients. The whites should be passed through a filter to remove particles of shells and other extraneous matter before being frozen. The egg whites may be packed without mixing to break up the thick white, or they may be mixed and thereby thinned. Egg whites to be utilized for their foaming ability should not have air whipped into them since it tends to impair their ability to foam.

State Regulations Pertaining to Egg Processing Plants

Some States have special sections in their egg laws or regulations pertaining to egg processing plants. Usually, the regulations have to do with special licensing provisions. After an application for a license to operate is filed, an authorized official must inspect the plant and equipment and ascertain that they meet the cleanliness and sanitation requirements of the State, before approval is granted.

U. S. Department of Agriculture Regulations

The U. S. Department of Agriculture has never issued standards and grades for egg products. Egg products are, however, subject to the provisions of the Federal Food, Drug and Cosmetic Act. In general, the law prohibits the interstate sale of adulterated and misbranded foods.

Label information on the egg products can should state the ingredients and thereby identify the type of product. According to the Standards of Identity of the Federal Food, Drug and Cosmetic Act of 1938, whole eggs consist of yolks and whites in their natural proportions as broken out of the shell. Frozen yolks are yolks of eggs of the domestic hen so separated from the whites so as to contain not less than 43 percent total egg solids. Sugared yolks and salted yolks are standardized at not less than 43 percent solids before the sugar or salt is added.

When plants voluntarily operate under the continuous supervision of a USDA licensed inspector, the entire processing operation is checked for adequacy of facilities, sanitation of equipment and operating procedures, types of raw material (breaking stock) used, and the finished egg products. When the inspection service is used, the "Regulations Governing the Grading and Inspection of Egg Products" are applicable. The regulations contain the minimum requirements for sanitation facilities and operating procedures for installation of an egg breaking room which will be operated under USDA inspection. Single copies may be obtained free from the Poultry Division, Agricultural Marketing Service, U. S. Department of Agriculture, Washington 25, D. C.

